

DIVISION 33 - UTILITIES
SECTION 33 05 23 – TRENCHLESS UTILITY INSTALLATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes
1. Work associated with highway crossings and trenchless stream crossings (if applicable).

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials
1. (H-20): (AASHTO) Loading for Conduits Installed under Streets, Road, or Highways.
- B. American Society for Testing and Materials:
1. ASTM A 53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 2. ASTM A 139, Specification for Electric-Fusion (Arc) – Welded Steel Pipe (NPS 4 in. and over).
 3. ASTM C 32, Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 4. ASTM C 33, Specification for Concrete Aggregates.
 5. ASTM C 150, Specification for Portland Cement.
 6. ASTM C 270, Specification for Mortar for Unit Masonry.
- C. American Welding Society: AWS D1.1 Structural Welding Code.
- D. PENNDOT Specifications, Publication 408, as supplemented.
1. Section 703.2 Coarse Aggregate
- E. State Code: Commonwealth of Pennsylvania Code, Pennsylvania Title 67, Transportation, Department of Transportation.
1. Chapter 459, Occupancy of Highways by Utilities,
 2. Chapter 203, Temporary Traffic Control Guidelines (PENNDOT Chapter 203).

1.03 SUBMITTALS

- A. Submit in accordance with the requirements of Section 01 33 00.
- B. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of Products to be installed.
- C. Certificates: Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop tests have been made as specified.

1.04 QUALITY ASSURANCE

- A. Provide work of this Section in accordance with these Specifications and as shown on the Contract Drawings.
- B. Workmen Qualifications:
 - 1. Use only personnel thoroughly trained and experienced in the skills required.
 - 2. Welds shall be made only by welders, tackers and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code AWS D1.1 of the American Welding Society to perform the type of work required.
- C. Design Criteria:
 - 1. Encasing conduit under highways shall be of sufficient strength to support all superimposed loads, including an American Association of State Highway and Transportation Officials H-20 Loading with 50 percent added for impact.
 - 2. Encasing conduit under railroads shall be of sufficient strength to support all superimposed loads, including a Cooper E-80 Loading with 50 percent added for impact.
- D. Requirements of Regulatory Agencies:
 - 1. Work of this Section within State Highway right-of-way will be subject to inspection by representatives of PENNDOT, and the work must be performed in accordance with the requirements of the latest edition of the Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 459, Occupancy of Highways by Utilities.
- E. Source Quality Control:
 - 1. Shop Tests: The Authority reserves the right to require Contractor to perform such tests as be necessary to establish the quality of the material offered for use.

| MATERIALS | TEST METHOD | NUMBER OF TESTS |
|------------|-------------|--|
| Steel Pipe | ASTM A 139 | As specified in ASTM A 139 or ASTM A 53 |
| | ASTM A 53 | As applicable |

- 2. Laboratory Tests: The Authority reserves the right to require that laboratory tests also be conducted on materials that are shop tested.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Transport, handle and store materials and Products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.

1.06 SITE CONDITIONS

- A. Classification of Materials:
 - 1. Classification of Excavated Materials: No consideration will be given to the nature of the materials encountered in boring, tunneling, drilling, or jacking operations or for difficulties encountered during excavating or handling of materials. Remove rock encountered during the boring, tunneling or jacking operation in accordance with Section 31 23 33.
- B. Scheduling:
 - 1. Perform boring, tunneling or jacking operations continuously on a 24-hour basis if required by PENNDOT.
- C. Environmental Requirements:
 - 1. As specified in Sections 31 23 33 and an Erosion and Sedimentation Control Plan.
- D. Protection: As specified in Sections 31 23 33, and such added requirements included herein.
 - 1. Adequately support and protect utilities and facilities that are encountered in, or may be affected by, the work.
 - 2. Structure Supports: As specified in Section 31 23 33.
 - 3. Accommodation of Traffic: As specified in Section 31 23 33.
 - 4. Explosives and Blasting: Not permitted in performance of work of this Section.
 - 5. Excavation Conditions: As specified in Section 31 23 33.
 - 6. Excess Materials: As specified in Section 31 23 33.
 - 7. Borrow Material: As specified in Section 31 23 33.

PART 2 - PRODUCTS

2.01 ENCASING CONDUIT

- A. Steel Pipe: ASTM A 139, Grade B or ASTM A 53, Grade B.

2.02 TUNNEL LINER PLATE

- A. Plates: Unless otherwise indicated on the Drawings, proposed sizes and thickness of

plates shall be submitted to the Authority along with shop drawings for approval. In no event shall the liner plate thickness be less than 0.1046 inches. All plates shall be formed from one piece of metal to provide longitudinal and circumferential flanges. The shape of the plates shall be such that erection and assembly of the liner plate structure can be completely and readily effected from inside the tunnel.

1. Plates shall be accurately curved to suit the tunnel cross sections, and all dimensions shall be of such size and accuracy that plates of similar curvature will be interchangeable. All plates shall be connected by bolts on both the longitudinal and circumferential joints.
 2. The tunnel liner plates shall be fabricated from structural quality, hot rolled steel, suitable for cold forming in closed dies and shall conform to ASTM A 570 Grade B for sheets or ASTM A 283 Grade B for plates.
 3. The tunnel liner plates shall be galvanized to meet AASHTO M167 specifications and shall be bituminous coated to meet AASHTO M190 specifications. Such coating to be a minimum thickness of 0.05 inches.
- B. Bolts and Nuts: Bolts and nuts shall be not less than 1/2 inch in diameter for 7 gauge plates and lighter, and not less than 5/8 inch diameter for liner plates heavier than 7 gauge. They shall be quick-acting coarse thread and conform to ASTM A 307, Grade A. The nuts and bolts shall be hot dip galvanized to conform to ASTM Specification A 153.

2.03 MISCELLANEOUS MATERIAL

- A. Concrete: As specified in Cast-in-Place: Section 03 30 00.
1. Class B: 3,000 psi.
- B. Aggregate Backfill:
1. PENNDOT 2A Coarse Aggregate conforming in PENNDOT Form 408, Section 703.
- C. Casing End Seals
1. Casing pipe ends shall be sealed with brick and mortar in accordance with applicable detail.
- D. Casing Spacers
1. The contractor shall utilize pre-manufactured casing spacers to support and center the carrier pipe within the casing pipe. The contractor shall use stainless steel casing spacers.
 - a. Stainless Steel Casing Spacers:
Casing spacers shall be bolt on style with a two-piece shell made from T-304 stainless steel of a minimum 14-gauge thickness. Each shell section shall have bolt flanges formed with ribs for added strength. Each connecting flange shall have a minimum of three 5/16" T-304 bolts. The shell shall be lined with a ribbed PVC extrusion with a retaining section that overlaps the edge of the shell and prevents slippage. Bearing

surfaces (runners) made from UHMW polymer with a static coefficient of friction of .01-.13 and shall be attached to support structures (risers) at appropriate positions to properly locate the carrier within the casing and to ease installation. The runners shall be attached mechanically by T-304 threaded fasteners that are inserted through the punched riser section and TIG welded for strength. Risers shall be made of T-304 stainless steel of a minimum 14 gauge. Risers shall be MIG welded to the shell. All welds shall be fully passivated. Casing spacers shall be model CCS as manufactured by Cascade Waterworks Manufacturing Co. or equal.

- b. Placement of Spacers on Carrier Pipe:
 - (1) General - One spacer shall be placed not more than two feet from each end of the casing. Subsequent spacers shall be placed at 6'-10' intervals within the casing.

2.04 CONTRACTOR OPTIONS IN PRODUCTS

- A. Contractor may install a larger diameter encasing conduit than what is agency minimum, provided that Contractor has secured the prior written approval of the applicable agencies having jurisdiction. If Contractor elects to install a larger diameter encasing conduit than is shown on the Drawing, all required clearances shall be maintained. Substitution of a larger diameter encasing conduit will be made without additional compensation over the price bid.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect Materials and Products before installing in conformance with the inspection requirements of the appropriate referenced standard.
- B. Remove rejected Materials and Products from the Project.

3.02 PREPARATION

- A. As specified in Section 31 23 33.

3.03 PERFORMANCE (All Highway Crossings)

- A. Excavation: As specified in Section 31 23 33 and such added requirements included herein:
 - 1. Should Contractor in constructing any crossing pit excavation below the subgrade for the pipes, he will be required to backfill the area excavated below the subgrade with Aggregate Backfill or with concrete as required by Engineer at his own expense and at no additional cost to Authority.
- B. Boring:

1. Boring shall conform to the applicable requirements of the regulatory agency and additional requirements specified herein.
 - a. Install the encasing conduit by the boring method to the limits indicated on the Drawings or such additional limits required by Engineer or regulatory agency.
 - b. Excavate and protect boring pit.
 - c. Provide devices at the front of the pipe to prevent auger and cutting heads from leading the encasing conduit. Unsupported excavation ahead of pipe is prohibited.
 - d. Over-cut by cutting head not to exceed the outside diameter of the encasing conduit by more than one-half inch.
 - e. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.
 - f. If voids develop or if bored hole diameter is more than 1 inch greater than the outside diameter of the encasing conduit, place grout to fill voids.
 - g. Check conduit alignment in a manner and at times required by Engineer. Check alignment and grade at least once per shift as the work progresses.
 - h. Completely bulkhead heading at interruptions in boring operation.
 - i. Completely weld joints around the circumference between sections of steel pipe encasing.

- C. Jacking:
 1. Jacking shall conform to all applicable requirements of the regulatory agencies and additional requirements specified herein. This operation shall be conducted without handmining ahead of the pipe and without the use of any type of boring, augering, or drilling equipment.
 - a. Install the encasing conduit by the jacking method to the limits indicated on the Drawings or such additional limits required by Engineer or the regulatory agencies.
 - b. Preliminary work shall consist of excavating and protecting an acceptable shaft on the downstream side of the crossing and the installation of a backstop and guide timbers.
 - c. Design: Bracing and backstops shall be so designed and jacks of sufficient rating used so that the jacking can be progressed without stoppage except for adding lengths of pipe.
 - d. Accurately place guide timbers on line and grade.
 - e. Support: The vertical face of the excavation shall be supported as necessary to prevent sloughing.
 - f. Use poling boards and bulkheads as required if subgrade conditions in

the heading are unstable.

- g. Jacking and excavation within the pipe shall proceed simultaneously with the ground being cut no more than 2 inch outside the pipe at the top and sides and not less than 2 inch above subgrade at the bottom.
- h. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.
- i. If voids develop or if jacked hole diameter is more than 1 inch greater than the outside diameter of the encasing conduit place grout to fill voids in manner approved by the regulatory agencies.
- j. Check conduit alignment in a manner and at times required by Engineer. Check alignment and grade at least once per shift as the work progresses.
- k. Completely bulkhead heading at interruptions in jacking operation.
- l. Completely weld joints around the circumference between sections of steel pipe encasing.

D. Tunneling:

- 1. Liner plates shall be assembled in accordance with the manufacturer's instructions.
- 2. Care shall be exercised in trimming the surface of the excavated section in order that the steel liner plates fit snugly against undisturbed material.
- 3. Excavation shall not be advanced ahead of the previously installed liner plates any more than is necessary for the installation of the succeeding liner plates.
- 4. The vertical face of the excavation shall be supported as necessary to prevent sloughing.
- 5. At any interruption of the tunneling operation, the heading shall be completely bulkheaded.
- 6. Unless otherwise approved by Engineer, the tunneling shall be conducted continuously, on a 24-hour basis.

E. Grouting:

- 1. A uniform mixture of sand cement grout shall be placed under pressure behind the liner plates to fill any voids existing between the liner plates and the undisturbed material.
- 2. Grout holes tapped for no smaller than 1-1/2 inch pipe, spaced at approximately 3 feet around the circumference of the tunnel liners, shall be provided in every third ring.
- 3. Grouting shall start at the lowest hole in each grout panel and proceed upwards simultaneously on both sides of the tunnel.
- 4. A threaded plug shall be installed in each grout hole as the grouting is completed

at that hole.

5. Grouting shall be kept as close to the heading as possible, using grout stops behind the liner plates if necessary. Grouting shall proceed as directed by Engineer, but in no event shall more than six linear feet of tunnel be progressed beyond the grouting.
- F. Laying and Testing Pipe: Lay and test pipe in encasing conduit as specified in Sections 33 11 00 and 33 08 10 and such added requirements included herein.
- G. Encasing Conduit Filling and Closing: After the carrier pipe has been installed in the encasing conduit and has been tested, close the end of the casing pipe in accordance with manufacturer's instructions for casing end seals.
- H. Cleanup: As specified in Section 31 23 33.

3.04 FIELD QUALITY CONTROL

- A. Testing: After laying pipe in encasing conduit, conduct line acceptance testing as specified in Section 33 08 10.

END OF SECTION